

CHAPTER 1

GENERAL INSTRUCTIONS

1-1. PURPOSE. The purpose of this manual is to identify and establish design requirements and to provide instructions for the preparation of facility designs, specifications, design analyses, cost estimates, and systems engineering plans for projects managed by the U.S. Army Corps of Engineers, Huntsville, subsequently, called the Design Agency. The information is presented by design disciplines and/or by associated support efforts covering the following areas: presentation of data, specifications, drafting standards, systems safety, civil, architectural, structural, electrical, mechanical, systems engineering and advanced research technology, and cost estimating. Each chapter addresses the major aspects of an engineering discipline and includes an overview of the administrative elements essential for successful management of engineering and construction programs. Appendices A through K provide assistance in project development and standardization.

1-2. APPLICABILITY. This manual applies to contractor and civilian personnel, other Government agencies, and in-house personnel involved with the design and construction of facilities for which USAEDH is responsible. The procedures and instructions in this manual will be referenced in all Architect-Engineer (A-E) contracts where applicable. In the event of conflict between this manual and the contract documents, the contract will take precedence. Conflicts will be brought to the immediate attention of the USAEDH Project Manager.

1-3. REFERENCE DOCUMENTS. Execution of design and construction programs are guided by regulations. Designers and design reviewers must be thoroughly knowledgeable with the documents listed below and the discipline-related documents referenced in each chapter. It is the contractor's responsibility to obtain a copy of the cited regulations. Also, it is important that the latest revision of each document be used. Department of the Army (DA) Pamphlet 25-30, Consolidated Index of Army Publications and Forms, provides current information on all publications.

- a. Architectural and Engineering Instructions (AEI), Design Criteria
- b. Army Regulation (AR) 415-15, Military Construction, Army (MCA) Program Development
- c. AR 415-10, Military Construction, General
- d. AR 415-20, Project Development and Design Approval
- e. AR 415-35, Minor Construction
- f. AR 210-50, Housing Management
- g. Engineering Regulation (ER) 1110-3-110, Information Systems Design for Support of Military Construction
- h. Engineering Circular (EC) 25-7-7(FR), Procurement Authority for Federal Informa-

tion Processing Resources

- i. ER 1110-345-51, Cost Targets (Military)
- j. ER 1110-345-100, Design Policy for Military Construction
- k. ER 1110-345-101, Current Design Information System
- l. ER 1110-1-263, Chemical Data Quality Management for Hazardous Waste Remedial Activities

1-4. ASSIGNMENT OF PROJECT MANAGER. A USAEDH Project Manager (PM) is assigned on all projects. The PM is responsible for the day-to-day coordination and for management of the project and of the A-E contract. The PM also ensures that program objectives are developed, mission goals are accomplished, and cost control and comprehensive management policies are implemented. All questions will be directed to the PM unless the Chief, Engineering Directorate appoints a lead engineer/architect, then technical questions will be directed to the lead engineer. All written communications will be addressed to:

US Army Engineer Division, Huntsville
ATTN: CEHND (PM Name)
P. O. Box 1600
Huntsville, AL 35807-4301

1-5. CONTRACTING PROCEDURES. Contract procedures are set forth in Federal Acquisition Regulations (FAR's), the Department of Defense FAR Supplement (DFARS), the Department of the Army FAR Supplement (AFARS), and the Engineer FAR Supplement (EFARS). Architect-Engineers are selected to perform design and engineering studies and services in accordance with Public Law 92-582, which enacted the Brooks Bill. After selection and approval are final, USAEDH will notify the A-E in writing of his selection for potential contract work. This notification will contain a scope of work and all pertinent draft contract documents, representations and certifications, and proposal instructions. The A-E may be requested to visit USAEDH to participate in a pre-negotiation conference prior to preparing a proposal and entering negotiations. During pre-negotiations, all phases of the effort that will affect the contract cost are discussed to assist the A-E in making an equitable proposal. At this time, the A-E will be given a copy of this manual, the design criteria, and other data that clarify the scope of the work to be performed. The submittal date for receipt of the cost proposal will be established by mutual agreement. The negotiation date will be established depending upon the availability of audit information (if required) or the Government's decision to proceed subject to later adjustments as a result of the audit findings.

1-6. NEGOTIATION. Negotiations will be held to ensure a mutual understanding of the scope of the work (SOW) and to agree on a fair and reasonable price. During negotiations the contract documents will be reviewed and revised as necessary, and the A-E's proposal will be examined and discussed in detail. When an agreement has been reached, the Government will obtain all necessary approvals, and the A-E will receive written notification of contract award. The contract document and a resume of negotiations will be forwarded to the A-E for signature, normally within two weeks after notification of award.

1-7. CONTRACT ACCOMPLISHMENT. The following provisions are general instructions

applicable to the A-E during design development.

a. Gifts or Gratuities. A-E's are reminded of the Standards of Ethical Conduct for Employees of the Executive Branch (5 C.F.R. 2635) prohibiting Government personnel from accepting gifts or gratuities from contractor personnel. The CFR lists specific examples, which can be generally summarized as follows:

The acceptance of gratuities by Department of Army personnel or members of their families, from those who have or seek business with DOD and from those whose business interests are affected by DOD functions, cannot be condoned. Such acceptance, no matter how innocently tendered or received may be a source of embarrassment to DA, may affect the objective judgment of the DOD personnel involved, and may impair public confidence in the integrity of the Government.

Department of Defense (DOD) Directive 5500.7 (the Joint Ethics Regulation) sets forth some limited exceptions to this general policy. However, it should be noted that Government employees are required by regulation to report all attempts to influence them in any way.

b. Conduct of Work. In the performance of the work, the A-E firm will be required by contract to:

(1) Make a diligent and aggressive effort to meet project schedule milestones which were established during negotiations. Bring to the PM's attention any conflict in criteria or any condition that appears to place the schedule in jeopardy if not resolved.

(2) Prepare a summary and furnish a copy to USAEDH of all significant discussions (meetings, site visits, conferences, or telephone conversations) between the A-E and USAEDH, between the A-E and other Government agencies, and between the A-E and other contractors relating to work under this contract.

(3) Promptly furnish a copy to USAEDH of all written communications received from other Government agencies or other contractors pertaining to work under this contract, except where it is clearly indicated that a copy of each communication has been furnished to USAEDH by the originator.

(4) Take measures to obtain clarification to design criteria, to acquire pertinent design information, and to incorporate such information in the work being performed.

(5) Coordinate and interface with other firms, consultants, and contractors performing work under the program, upon being advised by USAEDH that such firms or individuals have an officially authorized interest in the program and have a proper security clearance.

c. Progress Reports. The A-E will submit monthly progress reports in letter form. The reports will address the status of all elements of work performed during the reporting period, provide a narrative of all elements anticipated for performance during the next reporting period, and provide a summary of all problems encountered and their resolution. The report will also

provide a listing of all elements of work computed to date and the estimated percentages of all contract work completed as of the reporting period date. The elements reported must be on a task level unless a lower reporting level is ordered by the Contracting Officer (CO).

d. Payment. Partial payments can be made monthly for the amount and value of the work and services performed by the A-E in accordance with the General Clauses of the contract. Payment estimates will be submitted on ENG Form 93 for fixed-price contracts (appendix A, figure A-1) plus Standard Form 1034 for cost-plus contracts (figure A-2). These submittals will be verified by a Huntsville Division PM, using an independent analysis of progress. Payments must be processed within 30 days after receipt of the payment estimate unless there are disputed charges.

1-8. PUBLIC RELEASE OF INFORMATION. A-E's participating in design and construction activities supervised by USAEDH are authorized to conduct advertising and public relations activities regarding their participation. However, to ensure that the true perspective of the individual's or firm's part in the program is projected, all advertising copy, layouts, or any information released will be submitted to USAEDH for review prior to release. A-E's and contractors are cautioned not to discuss projects, future programs, or any plans with anyone not directly concerned with a new project prior to public release by USAEDH.

1-9. GENERAL GUIDANCE. The A-E should be familiar with other technical aspects of the project which bear on work performance. General guidance follows:

a. Architectural and Engineering Instructions (AEI), Design Criteria. This manual contains mandatory provisions applicable to the design and construction of all military facilities. The AEI design criteria will be used as a reference publication for all succeeding chapters in this manual. Deviations from the requirements contained in the AEI criteria are not permitted, unless waivers have been requested and approved in the manner prescribed by Headquarters, U.S. Army Corps of Engineers (HQUSACE).

b. Index of Standard Designs. Engineering Pamphlet (EP) 1110-345-2, "Index of Design Drawings for Military Construction," is an index of standard design drawings for military construction including standard and definitive designs, and design guides. This group of standardized design criteria is not a part of the contract criteria package, but is available by

request from Huntsville Division, ATTN: CEHND-ED-ES-S (Service Branch), telephone numbers: Commercial (205) 895-1402.

c. Contracting Officer Authority. Work performed under USAEDH contracts may require coordination with other Government agencies and contractors. A-E firms are cautioned against accepting direction that impacts the contract scope of work except as directed by the CO. Any changes ordered by anyone other than the CO must be brought to the attention of the CO before work is performed as changed. Direct contact between the A-E and other agencies and contractors will be made only with prior USAEDH authorization.

d. Quality of Work. Contract drawings and specifications will be complete and in detail sufficient to attract prudent and competitive bids and to afford a clear understanding of the project throughout construction. Work will be organized so as to ensure proper coordination among various details on drawings, among various sections of the specifications, and between the drawings and specifications. The A-E will cross-check all work until he is satisfied that all

conflicts have been resolved. The following specific items will be addressed:

- (1) Elimination of economically unsound construction details.
- (2) Elimination of unrealistic tolerances.
- (3) Elimination of restrictive specifications.
- (4) Bid response requirements, i.e., requiring bidders to submit information regarding equipment, subcontractors, or suppliers with their bids.

e. Criteria. USAEDH will furnish the A-E all available data and criteria concerning the work. Usually these criteria take the form of definitive drawings showing building floor plans, sketches, general site layouts, a project development brochure, and other special criteria as made available by the Using Agency. (The Using Agency is any customer (major military command or Federal agency) that USAEDH provides engineering, management, or construction services to fulfill that agency's agreed on requirements.) The A-E should familiarize his organization with the criteria since his design must conform with all applicable requirements contained therein. Any deviations including the use of criteria obtained directly from the Using Agency or other sources must be considered and resolved by USAEDH. If it is determined that the technical criteria is not met, the A-E will be required to adapt his design to the project criteria at his own expense within the prescribed time schedule. Questions or problems encountered by the A-E in complying with the criteria will be submitted to USAEDH for resolution.

f. Energy Conservation and Life Cycle Cost Design Analysis. A multi-discipline energy conservation design analysis will be prepared for each design that addresses the requirements of and includes the results of studies addressed in Chapter II of the AEI. Designs will incorporate all applicable requirements of energy conservation as mandated by the AEI, unless otherwise stated in the scope of work.

g. Fire Protection Design Analysis. A Fire Protection Design Analysis will be prepared for each design. The requirements for this multi-discipline design analysis are specified in Military Handbook 1008B.

h. Site Safety Plans. Prior to start of design, any project associated with or any project that deals with explosives must have a Site Safety Plan (SSP) approved by the US Army Technical Center for Explosives Safety, ATTN: SMCAC-ES, Savanna, IL 61074-9639. No deviations are permissible during design that affect the integrity of the Site Safety Plan.

i. Topographic Surveys. The Government will furnish topographic information for the geographic areas which concern the A-E's work unless the contract provides otherwise. This will usually consist of reproducible, A1 or F-sized sheets of topography, showing existing physical features on a metric scale of 1:500 with 0.5-meter or 1-meter contours or an inch-pound scale of 1 inch = 40 feet with 1- or 2-foot contour intervals. The survey data will be furnished to the contractor in INTERGRAPHTM Computer-Aided Design and Drafting (CADD) files unless otherwise specified by Huntsville Division.

j. Geotechnical Investigation. Geotechnical investigations, including soil and rock

borings, sampling, laboratory testing, seismic studies, and well pumping tests and pile load tests, where applicable, will be conducted by USAEDH at no cost to the A-E, unless provided otherwise in the A-E contract. Foundation design will be in accordance with the provisions of chapter 7, Structural.

k. Systems Engineering. Certain complex projects require that accepted procedures be implemented prior to design and during design and construction which describe the user's operational needs in terms of system performance, operability, efficiency, and reliability. When implementation of these procedures are required by the scope of work, the A-E will follow the guidance included in chapter 15, Systems Engineering.

l. Configuration Management (CM). Configuration management is the system (or management tool) used for controlling and tracking changes that occur during the design and construction of a program or project. When changes are submitted, configuration board members review and recommend actions to be taken on technical issues, costs, and schedule impacts. Configuration management is typically designated for major complex programs, but the same principles can be applied to any size project. The four major principals of CM, per MIL-STD-973, are: (1) Identify the items for CM; (2) control changes to those items; (3) record and track the changes; and (4) verify change implementation. USAEDH will use configuration management (discussed more thoroughly in Chapter 15) to revise and update changes to its projects.

m. Maintenance Accessibility Requirements. To properly fulfill its mission, each facility must be carefully designed for operability and ease of maintenance, both preventive and corrective. To attain this goal, the A-E's designs will reflect (1) that operational devices which are critical during emergency conditions are conveniently located and identified; (2) that adequate access and approach space is available to the equipment for maintenance and repair; (3) that equipment operating parameters are identified; and (4) that the normal design effort has addressed interference problems among operating systems and associated equipment, architectural, structural, and safety and fire protection systems.

1-10. DESIGN REVIEW

a. Objectives. One of the most important objectives of the Corps of Engineers encompasses production of quality facilities that satisfy the Using Agency requirements. To accomplish this, comprehensive technical design reviews are performed, to a degree commensurate with the complexity of the project, that ensure the design complies with current criteria, policies, standards, regulations, and directions of the Using Agency and of USACE. These design reviews do not in any way relieve the A-E of its quality control requirements. A-E's are contractually accountable for design quality under the terms of the contract.

b. Review Phases. All work under contract will be subject to review by representatives of the CO. The review schedule will be provided in the contract. Usually, a concept design review, an intermediate review, and a final design review will take place, depending on the requirements of the SOW. Additionally, joint design review conferences with representatives of all agencies or parties having a direct interest in the project will be held. When necessary, additional conferences pertaining to specific problems may be requested by the A-E or directed by the CO.

(1) A Concept Design Review is required for Army projects. The concept phase

represents approximately 35% of the total design effort. It offers functional and project cost verification of the Program Document and special user requests. The concept design will provide a complete description of the proposed project and the standards to be used in the final design including the estimated cost.

(2) An Intermediate Design Review takes place mid-way between concept and final design reviews. The need for this review is dependent upon the complexity of the project and will occur if required by the contract scope of work or directed by the Contracting Officer. The intermediate design is used to check progress and cost.

(3) The Final Design Review will occur at the completion of design and prior to final submittal of the construction contract documents and design analysis. These submittals will be reviewed for technical quality, accuracy, and completeness. The project contract drawings and specifications will be verified to ensure that all approved or agreed upon review comments from the previous review phases are included. Drawings and specifications will be complete to the extent that the Design Agency is ready to advertise for bids.

Submittal requirements for each review phase are addressed below.

c. Review Requirements. Prior to each design review, the A-E will reproduce and distribute to the designated agencies sets of drawings, specifications, and the design analysis. Materials will be provided in accordance with the submittal requirements and schedule established in the SOW. Reviewers will prepare comments concerning the design on CEHND Form 7 (see appendix A, figure A-3), or as designated in the SOW. During the design review conferences, the action column of the Form 7 will be used to record the action taken in response to all comments made during the review conference. The A-E will prepare minutes of design review conferences. The minutes (including a copy of the annotated CEHND Form 7) will be sent to each participating agency within seven (7) days after the conference.

1-11. SUBMITTALS. Submittals are deliverables to USAEDH detailed in the negotiated scope of work. Submittals may take the form of studies, design analyses, drawings, specifications, cost estimates, etc. Other review materials will be consistent with the CO's direction. Identified below are minimum requirements for each submittal; specific design submittal requirements are provided in subsequent chapters.

a. Concept Design Submittals. The concept drawings should be developed for use in the final drawings insofar as practicable. Concept submittals will be prepared in accordance with chapter 2, Presentation of Data, and the following detailed instructions.

(1) Drawings. Concept drawings will be prepared to appropriate drawing scale, and as appropriate, will include, but not be limited to the following:

(a) Site development drawings will show new and existing contours, controlling grades, storm drainage, and the relation of buildings to existing or proposed roads, streets, parking areas, rail sidings, utilities, and floor elevations.

(b) Floor plans will show overall dimensions and the functional arrangement of areas, including corridors, exits, stairs, and utility spaces. Building orientation must be properly related to exterior access, vehicle parking, service areas, etc. Individual treatment will be given to special designs or items involving deviation from normally accepted standards. Pertinent

information regarding fire prevention and safety requirements will be indicated. Gross floor areas will be shown for each floor and for the entire building. Column lines will be designated to aid in location of project components.

(c) Fire Protection Code Compliance Plan(s) will be drawn as described in Chapter 6.

(d) Elevations and sections will show story heights, fenestrations, suspended ceilings (if any), and partitions in relation to finish grades. They will also show materials, thickness of materials, methods of attachment, and the relation of fenestration to supporting columns or walls.

(e) Structural features will include floor, wall, and roof framing systems with sizing of typical members. Typical sections will indicate the method of framing. Design loadings will be noted on the drawings.

(f) Mechanical features will show heating, ventilation, air conditioning, plumbing, and fire protection requirements as identified in chapter 10, Mechanical.

(g) Electrical features including power generation and distribution, lighting, communications, instrumentation, and electronic equipment will be shown in sufficient detail to allow the preparation of an estimate reflecting the cost of the facility electrical features. Specific information concerning design reviews is covered in chapter 8 of this manual.

(h) The A-E will be furnished a list of Government-furnished equipment (GFE), arranged by reference designator, for equipment to be installed by the construction contractor. A separate list of Contractor-furnished equipment (CFE), arranged by reference designator, will be developed by the A-E for equipment installed by the construction contractor. Drawings will provide equipment schedules and identification tag numbers. Tag numbers and reference designators for equipment will be established according to the contract scope of work. For systems where operation and maintenance (O&M), safety, and logistics are critical, the A-E will provide equipment operating parameters similar to the list shown in appendix J.

(2) Outline Specifications. Outline specifications will be required as a part of the concept design submittal and as described in chapter 3, Project Specifications.

(3) Design Analysis. A design analysis is required as a part of the concept design submittal in support of information depicted on the concept drawings. The first volume of the analysis, General Description, will include a summary of the design philosophy and assumptions, the history of the project, and reference sources such as criteria furnished by USAEDH, letters, codes, conference minutes, and pertinent research. The general description may be illustrated by diagrams and sketches that aid in the understanding of design concepts. The design analysis will document significant design choices. That is, it will address alternative systems, arrangements, and hardware that were considered in arriving at the recommended concept and the rationale for selection of the alternatives recommended. The justification of each major selection and design decision must be stated clearly. The analysis will also describe the design provisions made to enhance and to reduce the costs of operation and maintenance of the facility. The design analysis will be in sufficient detail to permit verification that the concept design complies with the criteria and conforms with applicable codes and standards. The Energy Conservation and Life Cycle Cost Design Analysis and the Fire Protection Design Analysis will also be submitted as part of the General Description. The second volume will contain the outline

specifications mentioned above. The design calculations, both computerized and manual, will be prepared as volume 3. The design analyses will be submitted as required in chapter 2 of this manual.

(4) Concept Design Cost Estimate. This cost estimate will be submitted based on the concept plans and specifications.

(5) Approval. Based on the results of the design review conferences and the agreed upon action items, the A-E will revise the concept submittal. If directed by the CO, the A-E will resubmit the revised documents to USAEDH. The A-E is cautioned not to proceed to the next phase until directed by the CO. USAEDH will obtain approval authentication from the Using Agency for functional adequacy.

b. Intermediate Design Review Submittals

(1) The intermediate design is not a standard Corps of Engineers' requirement. The need for an intermediate design review is determined by the complexity of the design project and/or the need to check the design progress. The requirements of the intermediate design submittal will be established at the pre-design conference and included in the scope of work or at the direction of the CO.

(2) The intermediate submittals will consist of drawings, marked-up Corps of Engineers Guide Specifications (CEGS), A-E prepared specification drafts, updated design analysis, and a revised cost estimate. The final design will not stop during review of the intermediate submittal.

c. Final Design Review Submittals. At this point, the A-E is responsible for having incorporated all previous project review comments/corrections to the drawings, design analyses, specifications, cost estimates, etc., and having completed the design. The final 'ready-to-advertise' construction contract documents (drawings and specifications) will contain the necessary details to attract prudent and competitive bids and must be sufficient in technical quality, accuracy, and completeness to afford a clear understanding of the job throughout construction.

(1) Final design drawings will be prepared in accordance with the standards stated in chapter 2 of this document.

(2) For the final specifications the A-E will prepare specification sections (Construction Specification Institute (CSI) Divisions 1 through 16) as required to detail the project and supplement the drawings for the project. The specifications will be prepared in accordance with the instructions contained in chapter 3, Project Specifications, of this manual. Other documents to be prepared and submitted with the specifications include a cover sheet, bidding schedule, table of contents, list of Government-furnished equipment, list of proprietary items, work sequence, and construction duration as well as any other documents required to complete the package. The Government will prepare the contract clauses for the project unless otherwise specified in the contract.

(3) The final construction cost estimate must be provided according to TM 5-800-2, ER 1110-3-1300, and MicroComputer-Aided Cost Estimating System (M-CACES) Gold Manual. All projects, for which design is initiated, are supported by programmed cost estimates. Every

effort must be made by the designers to keep project costs within programmed funds while satisfying all functional criteria with an acceptable quality of design. If at any time during the course of design it becomes obvious that project costs will exceed the programmed funds available, the A-E will notify the USAEDH Project Manager. Chapter 17 provides specific guidance on the use of the M-CACES Gold programs and data presentation.

(4) The design analyses will be presented in multiple volumes. Volume I, General Description, is a revised and expanded version of the previous submittals. Volume 2 will contain the specifications, and Volume 3 will contain the design calculations. Chapter 2 provides specific instructions on the preparation of these volumes.

1-12. METRIC DRAWINGS AND SPECIFICATIONS. USAEDH has the capability to perform and/or support projects in either the inch-pound or metric system. CEGS and abridged guide specifications (CEAGS) have dual inch-pound metric units as design choices. The system to be used for design analyses and drawings will be designated in the scope of work.